



RECOMMENDATION FOR USE

CO-ORDINATION BETWEEN NOTIFIED BODIES
DIRECTIVE 2008/57/EC AND SUBSEQUENT AMENDMENTS
ON THE INTEROPERABILITY OF THE RAIL SYSTEM WITHIN
THE UNION

RFU RST 083

Issue 01
Date: 02/10/2013
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TITLE

CR LOC&PAS TSI : FATIGUE TYPE TESTS FOR WHEELSETS AND AXLES

SUBJECT RELATED TO

RAILCERT B.V.

CR LOC&PAS TSI (2011/291/EU) 4.2.3.5.2.1.

DESCRIPTION AND BACKGROUND EXPLANATION

Scope

This RFU covers conformity assessment concerning subsystem rolling stock according to CR LOC&PAS TSI (2011/291/EU).

References:

- EN 13103:2009
- EN 13104:2009
- EN 13260:2009 + A1:2010
- EN 13261:2009 + A1:2010
- Guide for application of the CR LOC&PAS TSI” (ERA/GUI/07-2011/INT, Version 1.00 of 26 August 2011

Introduction

In CR LOC&PAS TSI chapter 4.2.3.5.2.1. the following is stated for wheelsets and axles:

“Mechanical behaviour of axles:

In addition to the requirement on the assembly above, the demonstration of compliance for mechanical resistance and fatigue characteristics of the axle shall be based on EN13103:2009 clauses 4, 5 and 6 for non-powered axles, or EN13104:2009 clauses 4, 5 and 6 for powered axles.

The decision criteria for the permissible stress is specified in EN 13103:2009 clause 7 for non-powered axles, or EN 13104:2009 clause 7 for powered axles.

The fatigue characteristics of the axle (considering the design, the manufacturing process and the different critical axle areas) shall be verified by a **fatigue type test** of 10 million load cycles.”

Table H.1 in Annex H of CR LOC&PAS TSI requires a type test for 4.2.3.5.2.1 “Mechanical and geometrical characteristics of wheelsets”.

The table in Annex J of CR LOC&PAS TSI does not list any additional mandatory standards or sections of standards than those mentioned in chapter 4.2.3.5.2.1.

The “Guide for application of the CR LOC&PAS TSI” comments as follows on chapter 4.2.3.5.2.1. regarding mechanical behaviour of axles:

“The assessment of the axle potentially comprises two stages.

The first stage of the process is to perform a mechanical strength calculation and to evaluate the calculated stress against stress limit values.

The second stage, a bench test, should only be performed when the validity of the stress limit value used in the first stage have to be checked. EN 13260 and EN 13261 sets out the verification procedure to be followed for this verification.

A **full-scale fatigue testing**, which is **mandated** by the TSI, is required for the validation of the axle and wheelset assembly fatigue characteristics, but is **only required** when major changes are introduced in the manufacturer’s fabrication process for axle or wheelset, including those introduced by the material manufacturer or when the axle manufacturer changes the supplier of the material.”

The application guide lists as voluntary standards for the axles: EN 13260:2009 + A1:2010, EN 13261:2009 + A1:2010 for **fatigue characteristic verification and product verification**.

For Information

For fatigue allowable stresses generally one has to distinguish between

- material strength (i.e. material characteristics including notch sensitivity; determined on small specimen) and
- component strength (depending on geometry, manufacturing process etc.; determined on full scale representative specimens with similar geometry than the part in question or on original parts including press-fitted parts).

So in a first step, the material characteristics need to be known, and in a second step, the component strength has to be determined.

EN 13103, EN 13104, EN 13260 and EN 13261 follow these two steps: R_{fL} and R_{fE} are determined on small specimens, F1 to F4 are determined on full scale representative specimens.

EN 13103 / EN 13104 chapter 7.3 only requires a fatigue test if other steel grades than EA1N or EA4T are used. These tests are supposed to give the allowable fatigue stress values.

EN 13103 / EN 13104 Annex D (normative) specifies the full scale fatigue test for axles made from new steel grades other than EA1N or EA4T.

EN 13260 / EN 13261 chapter 3.2.2.2 requires a fatigue test for axles made from new steel grades other than EA1N or EA4T.

TSI WAG only requires a fatigue test for axles made from new steel grades other than EA1N or EA4T.



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Question:

Under which conditions is a new fatigue type test required for axles?

RFU PROPOSAL

Conclusion:

Axel design and manufacturing as addressed in the above-mentioned standards shall have a valid «qualification certificate» according to section I.5 (EN 13261) or section E.5 (EN 13260). In this case, the NoBo shall assess if the «product qualification approval certificate» scope covers the component under assessment.

The Notified Body may assume that a valid «product qualification approval certificate» according to section I.5 (EN 13261) or section E.5 (EN 13260) is evidence enough to support that the TSI requirements for fatigue testing are met if the following conditions are met:

- design specifications of EN 13103:2009 for non-powered axles, or EN 13104:2009 for powered axles are met, i.e.
 - a) geometric requirements (e.g. diameter ratios, notch geometry, transition radii, surface roughness etc.) and
 - b) the stresses determined by calculation and if relevant during test runs (braking, running, torsional vibration etc.) are below the allowable stresses of the EN 13103 / EN 13204 and
- standard materials (EA1N, EA4T) are used or a fatigue test is available for the same material;
- the axle manufacturer has a product qualification approval according to section E.5 EN 13260 :2009+A1 :2010 / section I.5 EN 13261:2009+A1 :2010 (or equivalent standard) and the approval covers the new axles with respect to the production methods and material.

If any of the above conditions are not fulfilled, new fatigue type tests for axles are required.

DATE OF AGREEMENT AT NB RAIL PLENARY MEETING

02/10/2013

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